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All the seeds were placed under the soil and put as nearly as possible under the same conditions. Whenever the weather was dry, they were watered twice every day. Five species germinated twice as many seed when planted pappus end up as the same species did when planted pappus end down.

This at least suggests a reason for the inversion of the ovule in these and many other seeds. By assuming the anatropous form, the seeds in this order are able to bring their hypocotyl near the opening at the base of the akene, and at the same time secure advantages to themselves in the process of germination. I cannot help but believe that these adaptations are a factor in making the Order Compositæ the largest of the orders of flowering plants, in the number of its species as well as in the great abundance of individuals in some of its species.

WOMAN'S WORK FOR WAGES.

BY C. R. HENDERSON, RECORDER AND ASSISTANT PROFESSOR OF SOCIAL SCIENCE IN THE UNIVERSITY OF CHICAGO.

SOCIAL science has few more important problems than the conditions and effects of the earning of wages by women. Some sanguine advocates of women's rights apparently do not see that there are grave perils attending the enlargement of industrial activities on the part of the natural mistress of the home. They hail with rapture unmixed with foreboding the mere fact that the former "slaves of men" are becoming independent of the lords of creation. That access to new employments has its bright side there can be no reasonable doubt. There is a physical gain if the work is confined within certain limits and is adapted to the frame and forces of the sister toiler. Regular labor in sunny and well-ventilated rooms, or even in the open fields, is far better for health than idleness and husband-trapping. Intellectually, the sphere of mental life is vastly enlarged by the modern diversity of employment. There are domestic and social advantages in being able to wait and select a husband rather than take up the first thing in the shape of a man who offers a secure living. The economical advantage is so apparent that it needs nothing more than mention. At first sight all that a girl earns is clear gain, and is an absolute addition to the income of the family. In many occupations the dexterity, deftness, and honesty of female helpers have proved their superior value. As nurses, physicians of women and children, matrons of institutions requiring the presence of ladies, their gentleness and insight have been an untold blessing. These advantages are so real and great that any modifications of the present tendency to widen the industrial sphere of woman must take them into the account.

But there is also a very dark side to this subject. Passing the dangers of imposing labor prematurely on young girls, consider the indirect effects of feminine competition in some lines. That which we first see is a positive addition to family revenue. But later we discover that girls are taking the places of men at lower rates. This often means that the natural head and bread-winner is out of work or is receiving the woman's rate. The girl has herself to support, and that only in part. The man must support at least four persons. What must be the effect on domestic life? That which is actually observed: the husband and father at home while the daughter or wife is in the factory earning the living. Marriages are diminished, and among those most suitable for parents there are fewer births. A recent French economist of high repute gravely declares that the State ought to support and educate foundlings and orphans because the better members of society either cannot or will not keep up the population. What must be the results of propagating a human stock with such pedigrees? Ask the Kentucky horse-breeders. Think of the disorder of households where the normal conditions are reversed, the wife being in field or shop. Dr. Bushnell wrote about a "a reform against nature." It is against civilized human nature to throw the burdens of procuring sustenance upon those who have all they can endure in bearing, nursing, and starting the education of children. That cannot be a good tendency, economically or morally, which tends to extinguish a higher race. Herbert Spencer, in his pages on the *status* of women, gives abundant illustra-

tions of the law that the imposition of bread-winning on women belongs with savage conditions.

What can be done to secure the advantages of women's work for wages and avoid the perils? There are natural forces which counteract the momentum of these evils. Fortunately it is the disposition of most women to have a home of their own. This inclination, deep as human life and old as history, removes much female competition. But unconscious forces need to be supplemented by foresight, prudence, and philosophy. Biology, as De Greef teaches, is not sociology. There is a physical law of "must" and a moral law of "may" and "ought." Women should be taught that she who works for less than normal wages in order to get "pin money" is the foe of her kind, and is undermining the foundations of economic and domestic welfare. This conviction, once generally diffused, will create trade-unions. These unions, because they are human, have done many foolish and wicked deeds. But they never did a more foolish or wicked deed than they have done who taught that unlimited work of women, at any price they could get, was an unmixed good. If women unite and demand the normal rate of wages then it will be found out whether it is really profitable to hire them. If their peculiar gifts give them superiority they will retain their places at the proper rate. If men are really more fit for the places, they will be preferred. Thus this social disease might be healed. To let it alone is to let a cancer alone, or permit incipient consumption or germs of cholera to have free-course. To take hold of the evil with will and unity is to cure it. Thus alone will young men be able to marry at a suitable age, and young women will generally find their most congenial and happy places as mothers and educators and home-makers. There is sufficient earning force in men without forcing children to eat scraps of bread and cake out of scavenger barrels and without compelling women to exhaust their energies in field and factory.

HEREDITY.

BY JULIA BROWN STRODE.

ALL men are created free and equal, says that famous document the Declaration of Independence, and, in a remote and abstract sense, it may be true; but, all in all, we are bound by a thousand chains, and equality is unknown. Fetters have been imposed upon us by our forefathers; limitations have been set us by our ancestors, which it will take years of study and self-culture to overcome. And as to equality, this man may average well in one particular with his fellow-men, but is totally deficient in another respect, and no two men are alike. Many of the lower tribes in Africa, says Stanley, resemble the ape more nearly than human beings. Either these lower classes have sprung from a brute ancestry, or their lives and environments have continued such that they have taken on the dispositions and appearance of the higher animals with which they have been surrounded, and have transmitted them to their progeny. Whether we accept the theory of evolution or not, the fact remains the same, i.e., that many savage tribes are more allied to animals than to civilized man. But, whatever our parentage is, or may have been, true worth is recognized and acknowledged wherever it may be found.

The problem of how to intensify the higher attributes of human nature and obliterate the unworthy is the problem of the age. The old theory that children were sent into the world, figuratively speaking, mere pieces of blank paper was long ago exploded. The paper is all written, traced, and re traced. The child has as decided a character, though not one so easily discernable, when it enters the world as when it leaves it. As genius, disease, peculiarities of appearance often transmit themselves from parent to children, so do villainy, crime, and moral depravity.

Here is a child with the idiosyncracies, the peculiar mannerisms, of his great-grandfather dead before he was born. I know of a boy whose attitudes and voice are like no other member of his family, but that of an uncle whom he never saw. Often an individual returning to his home town, from which he has for years been absent, readily determines to what families the new-born generation belongs.

Drunkenness is an inherited disease. A celebrated physician makes an estimate that one-fourth of the cases of insanity are inherited. A race of scholars beget a race of learned men, men with brains capable of receiving much knowledge. Says Oliver Wendell Holmes in one of his greatest novels: "There are races of scholars among us, in which aptitude for learning is congenital and hereditary. Their names are always on some catalogue or other. They break out every generation or two in some learned labor, which calls them up after they seem to have died out. At last some newer name takes their place it may be; but you inquire a little and find it is the blood of the Edwardses, or the Chaunceys, or the Ellerys, or some of the old historic scholars disguised under the altered name of some female descendant."

Of course, there are individuals and families continually working their way up into these intellectual classes, and their posterity will rank with them. But many of us have the way already paved for us in inherited aptitude and brain-power.

Often acquired traits are transmitted until they become a distinguishing characteristic of the race or family, a part of them as it were. Sometimes certain unions, "felicitous crosses," produce an improved strain of blood and a prodigy is born. A child adopted and far removed from its family usually shows forth the disposition of its own people. Occasionally such a one will escape. A generation or two may be skipped, but, sooner or later, the old hereditary traits reappear, breaking out in the blood of the race, no matter what the outer influences may be. Rev. Oscar C. McCulloch, in an address before the National Conference of Charities, stated his having traced a certain family back for the greater part of a century, until the individuals found belonging to it numbered over five thousand, all but one of whom were either vagabonds or criminals. But one of the entire number lived to be an honorable man. Says this reverend gentleman, as quoted by Edward S. Morse in a late number of the *Popular Science Monthly*: "Efforts have been made again and again to lift them, but they sink back. They are a decaying stock; they cannot longer live self dependent. The children reappear with the old basket. The girl begins the life of prostitution, and is soon seen with her illegitimate child."

The entire populace of portions of our great cities is composed of an element such as this. Decency cannot exist within the borders of these slums. Truth cannot survive the diabolic cunning of the place. Missionaries and sanitary officers sent to aid this people are often murdered. "This class," says O. B. Fowler, "are an enormous expense to the State, a constant menace to society, a reality whose shadow is at once colossal and portentous." Millions of them every year start out over country as tramps, and return again to these quarters as winter sets in, to live by theft, crime, and beggary. Their increase is alarming. A race of vagabonds beget a race of vagabonds. What shall we do to prevent this increase? How shall we work a reformation? How shall we treat our criminals born, as it were, out of parallel with natural law? Shall such be allowed to beget a race in which their own characteristics are intensified? Shall such be treated as morally responsible for their misdoings? This is the great problem to be solved by our own and future generations.

"It is singular," says Holmes, "that we recognize all bodily defects that unfit a man for military service, and all intellectual ones that limit his range of thought; but always talk at him as if his moral powers were perfect. . . . I suppose," he continues, "that we must punish evil-doers as we extirpate vermin; but I don't know that we have any more right to judge them than we have to judge rats and mice, which are as good as cats and weasels, thought we think it necessary to treat them as criminals."

Truly, "the sins of the parent are visited on the children, even to the third and fourth generation." Truly, our influence is unending; our lives a blessing or a curse to all future time, just as the power and influence of the great past is interwoven within our own organizations.

Ah, yes! but hidden within this visible being is the *real man*, the overcomer, the spirit pure as when it left the Creator to be incarnated in mortal flesh. That let us recognize. Let us know ourselves, our faults and virtues, the chains that bind us, the aids that have been given us; but let us so recognize our own spirit

lives, our real selves; let us so far become individualists that we are masters and not slaves to inherited tendencies. And let us attempt to solve this great problem, here cited, for the good of our fellow-men and the strengthening and bettering of future generations.

A CONSIDERATION OF THE CLAIMS OF CHEMISTRY AS THE BASIS OF MODERN AGRICULTURE.

BY FRANK T. SHUTT, M.A., CHIEF CHEMIST, DOMINION EXPERIMENTAL FARMS, OTTAWA, CANADA.

AGRICULTURE may be considered at once the oldest of all arts and the youngest of the sciences. It has always had for its object the economic production of plants and animals and the materials elaborated by them during their life. This fact gives us a definition for the term agriculture that was as correct centuries ago as it is now.

Until comparatively late years agriculture existed, as far as the farmer was concerned, as an art only. The application of scientific or classified knowledge to the feeding of plants and animals began with the researches of Liebig and Davy in the early part of the present century. Since then an ever-increasing band of scientists — now spread over the civilized world — has been studying this vast subject with gratifying results. Agriculture, properly so called, has now passed beyond the ranks of empiricism and entered the realms of science.

Strictly speaking, agriculture should not be called a science. The problems which it presents call for their solution upon chemistry, botany, zoölogy, geology, and physics. Mechanics are also more or less closely connected with agriculture as an art, and have been of immeasurable value in reducing the cost as well as increasing the yield of field-crops.

It is to chemistry and animal and vegetable physiology, however, that we look for the answers of innumerable questions that are continually arising in the development of those living things which the farmer has to deal with. Indeed, a little reflection will convince us that it is difficult to state an agricultural problem that does not make demands upon chemistry and physiology for its solution.

Chemistry has to do with the composition of all matter, inert and living, and the changes which such is constantly undergoing. The conversion of soil substances and the constituents of the air into vegetable tissues, and the formation from these of animal tissues and products, though not as yet fully understood, are, nevertheless, truly chemical changes. Looked at chemically, we see nature as the work-shop, plants and animals as the chief agencies, man as the director. The material worked with consists of a limited number of elementary substances and their compounds; plants and animals are continually performing with this material the operations of analysis and synthesis.

Physiology treats of the functions of living things and their various organs; it seeks to explain with the aid of chemistry all the phenomena of life. Living matter is made up of cells capable of nutrition and reproduction. As the result of cell development, animal and plant tissues are formed. The changes which take place in these cells, primarily leading to their nutrition, and secondarily to their reproduction, are true chemical transformations. It becomes clear, therefore, that physiology is largely chemistry, and that the latter science in many instances furnishes the foundation and explanation of vital or physiological processes.

Thus we establish the claim that chemistry forms the basis of scientific agriculture.

Leaving with this brief outline of the fundamental importance of chemistry in the abstract to agriculture, let us proceed to examine somewhat more in detail the aid that this science gives to the farmer. To pursue economically and intelligently, modern agriculture in any of its branches requires an application of the principles of chemistry, since every farm operation, whether performed by nature or man, implies, as may be inferred from what has already been said, changes of material which can only be explained by chemistry and its twin-sister science, physiology.

Chemistry affords definite knowledge as to the amounts of the several constituents taken from the soil by field-crops, thus indi-